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ABSTRACT

Sickle cell disease (SCD) refers to a group of hereditary disorders of the structure of hemoglobin of red blood cells. This disorder involves the inheritance of two abnormal genes, which are related to the hemoglobin promotion, at least, one of which is the sickle cell gene. Nigeria, by virtue of her large population, has the greatest number of sufferers of SCD in the world. The prevalence has been found to be 10 persons with SCD per 1,000 population or 2%. This study assessed the knowledge and attitude of Nigerian adolescents to premarital genotyping and its counseling implications. Questionnaires sought to assess the knowledge of students about the presentation, acquisition, and method of diagnosis of sickle cell disease; determine the proportion of students who know their genotype; determine the acceptability of genetic counseling among students; and determine the effect of the knowledge and mode of acquisition would have on marital choice and childbearing intentions. (Contains 25 references and 15 tables.) (GCP)

KNOWLEDGE AND ATTITUDE OF NIGERIAN ADOLESCENTS TO PREMARITAL GENOTYPING

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Abstract

Sickle cell disease (SCD) refers to a group of hereditary disorders of the structure of haemoglobin of red blood cells. This disorder involves the inheritance of 2 abnormal genes, which are related to the haemoglobin promotion, at least, one of which is the sickle gene. Nigeria, by virtue of her large population, has the greatest number of sufferers of SCD in the world. The prevalence has been found to be 10 persons with SCD per 1000 population or 2%. This study assessed the knowledge and attitude of Nigerian adolescents to premarital genotyping and its counselling implications. Questionnaires sought to assess the knowledge of students about the presentation, acquisition and method of diagnosis of sickle cell disease (SCD), determine proportion of students who know their genotype; acceptability of genetic counselling among students and effect of the knowledge and mode of acquisition would have on marital choice and childbearing intentions.

Of the respondents 85.0% were aware of SCD and majority of them heard of SCD from relatives/friends at home, 74.0% know of the hereditary nature of SCD. More than half (65.5%) had done their genotype test; 51.8% of these did it out of personal choice. Only 4.1% did it as request from intending spouse. (89.9%) respondents agreed that couples should go for premarital genotyping and (86.4%) would ask their partners to go for premarital genotyping. However, only 39.7% of respondents said they would continue with marriage plans irrespective of genotype. It is suggested that further enlightenment campaigns, especially on subjects of prenatal diagnosis be given adequate attention.

Definition of Key Terms

Amino acid: A type of molecule used as a building block for protein construction.

Anaemia: A condition in which the level of haemoglobin falls below normal values due to a shortage of mature red blood cells. Common symptoms include pallor, fatigue, and shortness of breath.

Genotype: The genetic constitution of an organism. . It comprises the entire genes inherited from both parents and determines the hereditary potentials and limitations of an individual from embryonic formation through adulthood

Globin: One of the component protein molecules found in haemoglobin. Normal adult haemoglobin has a pair each of alpha-globin and beta-globin molecules.

Haemoglobin: The red pigment found within red blood cells that enables them to transport oxygen throughout the body. Haemoglobin is a large molecule composed of five component molecules: a haeme molecule, and two pairs of globin molecules

Jaundice: A condition characterised by higher-than-normal levels of bilirubin in the bloodstream and an accompanying yellowing of the skin and eyes.

Red blood cell: Haemoglobin-containing blood cells that transport oxygen from the lungs to tissues. In the tissues, the red blood cells exchange their oxygen for carbon dioxide, which is brought back to the lungs to be exhaled.

Introduction

Premarital genotyping is simply defined as knowing one's genotype before getting married. In this part of the world, most children grow up without knowing what their genotype is. This has led to an increase in the number of couples with the sickle cell trait getting married to produce children with sickle cell disease in its various forms. Premarital genotyping usually is accompanied by counselling, especially for couples that both carry the sickle cell trait. Where both partners carry the sickle cell trait, they have a 1 in 4 chance per pregnancy of having a child with sickle cell disease. Children with sickle cell disease experience many problems. They often suffer severe bone pain crisis and are frequently in and out of hospital. At the schooling level, i.e. nursery, primary, secondary and tertiary institution, they often miss school when their crisis begins. This has been known to make some students miss Federal examinations and thus repeat a year or more. People with sickle cell disease, especially those with very frequent attacks and frequent yellow eyes, feel that they are different and inferior to other children; they are often sick and cannot always play with other children. In young adulthood, most face the stigma of the opposite sex knowing they have sickle cell disease and not wanting to get intimately involved with them. Psychologically, some are depressed and frustrated with all the pain and agony they suffer in crisis. In addition, many employers, on finding out that an applicant for a job is a sickle cell disease patient, will be reluctant to offer employment. They feel the individual will be unable to work effectively and will miss many working days. These and many other factors led the present researchers to conduct this study.

Knowledge of Sickle Cell Disease (SCD) among Nigerian Adolescents.

The first recorded description of Sickle Cell Disease (SCD) in Nigeria has been attributed to African's Hurton (1874) in Adekeile (1992), who described the fever of crisis as the shifting joint pain. SCD has been recognised for generations in West Africa as "*cold season rheumatism*" describing a chronic recurrent condition characterised by shifting joint pain and fever of crisis as well as blood abnormalities. Moson has been credited in Adekile as the first to use the term sickle cell anaemia. Sickle Cell Disease (SCD) is caused by a change in the chemical composition of the protein (haemoglobin or Hgb) that carries the oxygen inside of the red blood cells (RBC's). The sickle cell trait is a genetically linked, inherited condition that arises from a single amino acid substitution in one of the component proteins of haemoglobin. Normal Hgb is a round or ball-shaped folded molecule composed

of 4 protein subunits - 2 alpha chains 2 beta chains. The chemical change is a valine amino acid substituted for glutamic acid in both of the beta chains (HbSS). These chemical changes in haemoglobin cause the shape of the molecule to change under certain conditions such as lowered oxygen concentration and dehydration. As a result of this substitution, Hgb molecules constructed with such proteins have a tendency to sticky to one another, forming abnormal strands of haemoglobin within the red blood cells. The cells that contain these strands become stiff and elongated--sickle shaped. The abnormal RBC's can damage the vessels around them and the tissues that depend on the vessels for oxygen and nourishment. For example, the damaged RBC's can cause thrombosis (clotting) and then secondary ischemic damage to the adjacent and surrounding tissues - causing infraction (cellular death).

Possession of Hemoglobinopathies (Hbs) is a major problem of tropical Africa. In Nigeria with an average population of 120 million citizens, the trait occurs in about 25% of the population thus making Nigeria the country with the highest number of sickle cell disease patients in the world (Azubike et al, 1990; Akinyanju, 1997). Researches conducted in Nigeria are showing increasing awareness of this disease. In Lagos for instance, following an active awareness campaign, a recent survey revealed that 49% of the subjects in the study were aware of sickle cell disease while 37% understood that it was inherited from parent, (Akinyanju, 1996) .However, in another study conducted amongst secondary school students in Kwara State, Ebomoiyie (1988) reported a low level of awareness about sickle cell diseases as indicated by low pre-test scores. A non-governmental organisational, 'The Sickle Cell Club Lagos' (SCCL) was founded in 1984 in Nigeria with the primary aim of helping affected members of the society, through proper medical and social care, to live as normal lives as possible in addition, to promoting the reduction of sickle cell disease by humane methods. The SCCL organizes support for parents and patients in form of counselling, which has been reported to be the least expensive and most accessible helpful activity under African condition. The SCCL had also succeeded in sensitising the government to the need for programme on control of SCD. The World Health Organisation, (WHO) has included SCD as one of the non-communicable disease. Studies of parents of sickle cell disease patients, especially in the third world, have shown that many of them never knew that they were carries of the sickle cell gene before marriage (Bamisaiye, Bakare, Olatoware, 1974).

In SCD, as in most autosomal recessive disorders, the majority of the abnormal genes are in healthy hetero-zygotes and they may be unaware of this unless they marry someone with the same harmful gene and have affected children. Parents frequently learn of their risk of bearing affected children only after a child is born with the illness. With the availability of

an inexpensive and specific test for the asymptomatic carriers of sickle trait, interest has developed in mass screening programmes to detect trait carriers prior to child bearing so that through counselling and education, they might have opportunity of making informed choices. Neal-Cooper et al (1988) and Harper (1988) have opined that this will give parents opportunity of deciding whether or not to have children and risk producing children with sickle cell disease. Hubbard and Hewifin (1985) and Abiodun (1993) have suggested that people contemplating marriage should be encouraged to carry out routine blood tests to know their haemoglobin types before marriage. In cases where both parents are found to be carriers of the sickle cell gene, they should be counselled on the risk involved in proceeding with marriage. The focus of this study therefore is to assess the awareness and acceptance of Nigeria Certificate of Education (NCE) students of College of Education, Ekiadolor Edo State to premarital genotyping. Specifically the following are the objectives of this study:

1. To assess the knowledge of the students about the presentation, acquisition and method of diagnosis of sickle cell disease.
2. To determine the proportion of students who know their genotype.
3. To determine the acceptability of genetic counselling as a method of control of sickle cell disease among the students.

To assess the effect of the knowledge of the presentation, acquisition and diagnosis of sickle cell diseases on marital choice and childbearing intentions.

METHODOLOGY

Population

A descriptive cross section study was carried out on the NCE students of College of Education, Ekiadolor. There are five schools in College of Education, Ekiadolor Benin, Edo State

1. School of Education
2. School of Arts and Social Sciences
3. School of sciences
4. School of Vocational and Technical Education
5. School of Languages

The college currently has a student population of two thousand three hundred and nine (2309)

Sample Size

For the purpose of this survey each of the schools (above) was denoted a cluster. The school of Arts and Social Sciences was randomly chosen. It has the following sub departments:

- Department of Economics and Geography
- Department of Economics and Mathematics
- Department of Economics and Social Studies
- Department of Geography and Social Studies
- Department of English and Social Studies
- Department of English and Music

The N.C.E. II and III students in School of Arts and Social Sciences were given the questionnaires. One hundred and fifty (150) questionnaires were distributed to the unmarried students (25 students from each department). It was an assessment in form of self-administered questionnaire, which were distributed to the 150 unmarried students. The questions were closed ended in nature and the students were requested to indicate their choice of responses by placing a tick in the boxes provided. The information required from each respondent was in respect to:

- Personal data, - sex, religion, year of study.
- Knowledge of presentation, acquisition and method of diagnosis of sickle cell disease
- Proportion of students who know their genotype.
- Acceptability of genetic counselling as a method of control of Sickle Sell Disease among the students.
- Effect of knowledge, presentation and mode of acquiring and diagnosis of sickle cell disease on marital choice and childbearing intentions.

DATA ANALYSIS

Table 1 below shows that majority of the respondents are between the age brackets of 17-18 years and 18– 19 years, i.e. 45.5% and 45.5% respectively and 5.5% above 20 years. 42.40% of respondents were males and 57.6% were females 87.4% are Christians and 12.6% are Muslims.

Table 1:
Frequency Distribution of Respondents According to Age, Sex and Religion.

CHARACTERISTICS	FREQUENCY	PERCENT
AGE GROUP		
15 – 17 years	6	3.40%
17 – 18 years	67	45.50%
18 – 19 years	67	45.50%
≥ 20 years	10	5.50%
Total	150	100.00%
SEX		
Male	64	42.40%
Female	86	57.60%
Total	150	100.00%
RELIGION		
Christianity	128	87.4%
Islam	22	12.6%
Total	150	100.00%

Table 2
Frequency of Awareness of SCD and Source of Awareness.

Awareness of SCD	**Frequency**	**Percent**
Yes	124	85.5%
No	21	14.5%
Total	**145**	**100.00%**
Source of awareness		
Family and relatives	45	35.4%
Teachers and lecturers	16	12.6%
Friends at home / school	30	23.6%
Print / electronic media	36	28.3%
Total	**127**	**100.00%**

85.5% of respondents are aware of SCD and 14.5% are not. Of these, 35.4% said the source of awareness was from family and relatives, 28.3% from print and electronic media, 23.6% from friends.

Table 3
Features Compatible With SCD

Features	**Yes**	**No**	**Not sure**	**Total**
Frequent illness	124	28	12	72
Joint & bone pain	32	4	4	132
Abdominal pains	7	44	5	56
Anaemia	5	35	13	53
Jaundice	5	-	2	7

124 (82.8%) respondents ticked that frequent illnesses were compatible features, while 32 (21.3%) ticked joint and bone pain.

FIGURE 1
FREQUENCE OF FEATURES ASSOCIATED WITH SCD

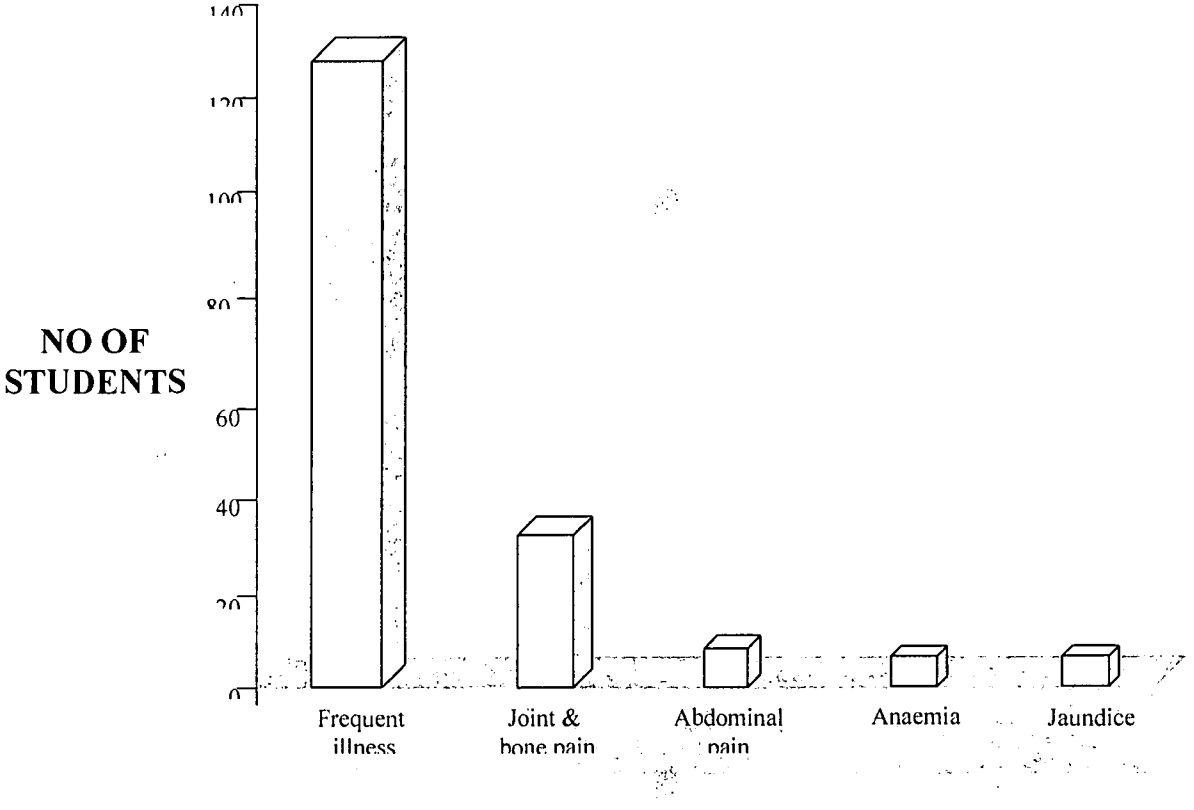
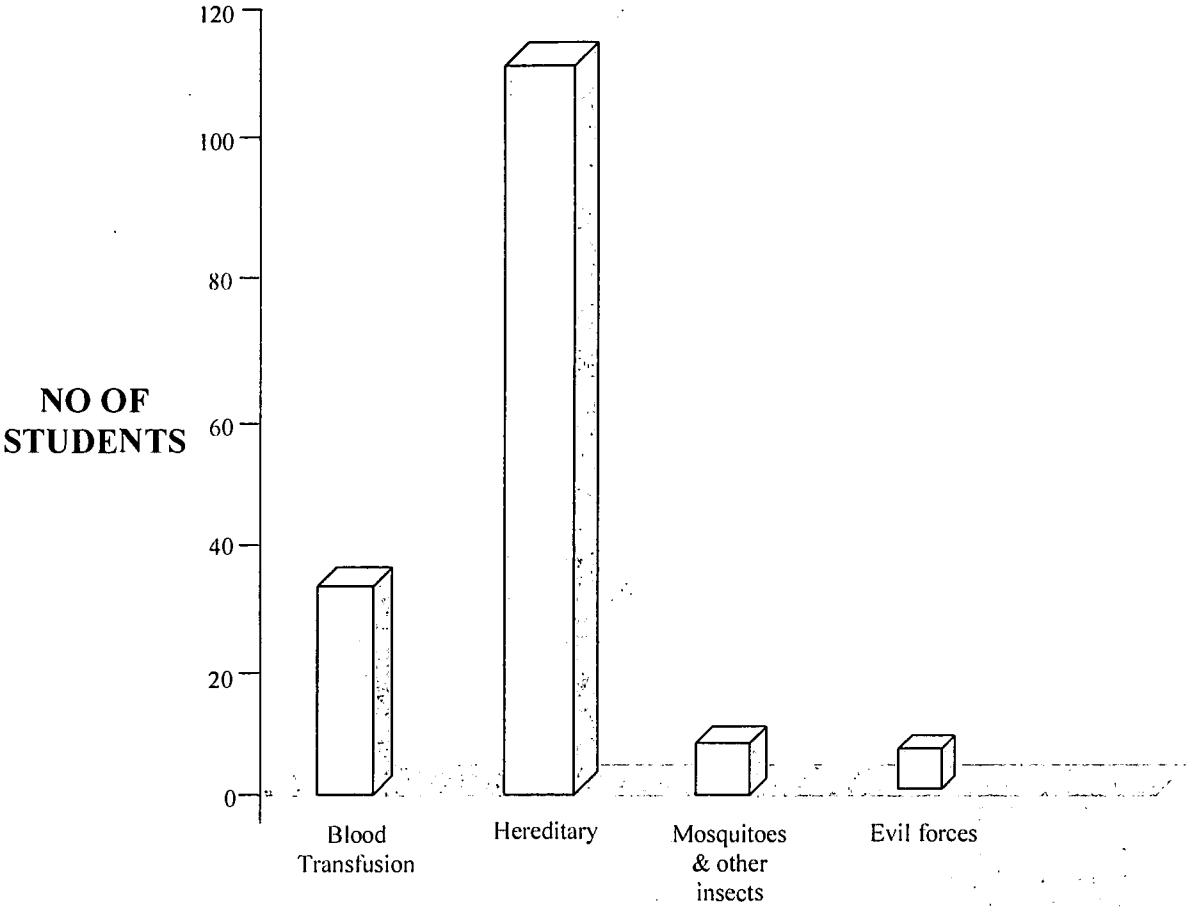


Table 4
Mode of Acquiring SCD

How the condition was acquired	Yes	No	Not sure	Total
Blood Transfusion	32	28	12	72
Hereditary	112	16	4	132
Mosquitoes & other insect bite	7	44	5	56
Evil forces	5	35	13	53

132 respondents think that SCD is acquired by hereditary means, 32 by blood transfusion, 7 by mosquito and other insects bite, 5 by evil spirit, while 5 said it was a curse.

FIG 2 SHOWS FREQUENCY OF HOW SCD IS ACQUIRED



BELIEFS OF RESPONDENTS

Table 5
Knowledge of Detection of SCD by Known Test, Frequency of Knowledge of Genotype Test and Percentage of Students Who Have Done Genotype Test.

Detect SCD by known test	**Frequency**	**Percent**
Yes	117	81.80%
No	11	7.70%
Not sure	15	10.50%
Total	**143**	**100.00%**
Knowledge of genotype test		
Yes	137	93.80%
No	9	6.20%
Not sure	-	-
Total	**146**	**100.00%**
Done haemoglobin genotype test before		
Yes	95	65.50%
No	46	31.70%
Not sure	4	2.80%
Total	**145**	**100.00%**

117 respondent (81.80%) think SCD can be detected by a known test. 137 people (93.80%) know of the genotype test, 9 respondents (6.20%) do not know genotype test. 65.5% had done their genotype test, 31.70% had not done it while 2.8% were not sure.

Table 6
Reason Why Test Was Done.

Who requested for the test	**Frequency**	**Percent**
Doctor/Nurse due to illness	18	18.60%
As part of pre school entry	25	25.80%
Personal choice	50	51.50%
Requested from intending spouse	4	4.10%
Total	**97**	**100.00%**

51.5% of respondents did the test by personal choice, 25.80% as part of pre school entry 18.60% by doctor due to illness and 4.1% as requested from intending spouse.

Table 7
Reason Why Test Was Not Done.

Reason for not doing the test	**Frequency**	**Percent**
Never heard about it	6	26.1%
Don't know where to do it	2	8.7%
Don't consider it necessary	15	65.2%
Total	**23**	**100.00%**

65.5% of those who did not do the test did not consider it important. 26.1% had never heard of it while 8.7% did not know where to do it.

Table 8
Percentage of Respondents That Think SCD Can Be Cured.

Can SCD be cured	Frequency	Percentage
Yes	36	25.40%
No	56	39.40%
Not sure	50	35.20%
Total	**142**	**100.00%**

25.5% think SCD could be cured, 39.40% said No and 35.20% are not sure.

Table 9:
Percentage of Respondents That Think SCD Can Be Prevented.

Can SCD Be Prevented	Frequency	Percent
Yes	119	81.50%
No	14	9.60%
Not sure	13	8.90%
Total	**146**	**100. %**

81.50% think SCD could be prevented, 9.6% do not think so while 8.90% are not sure

Table 10
Frequency of Preventing Measures for SCD

Preventive measure for SCD	Frequency	Percent
Selective marriage after testing	116	77.3%
Vaccination	12	8%
Testing genotype of unborn babies	47	31.3%
At risk couples to adopt children	5	3%
Others	1	6%

77.3% think that selective marriage after counselling is a preventive measure for SCD, 31.3% support the determination of the genotype of unborn child, 8% vaccination, 3% believe that couples at risk should adopt children, while one person says divine intervention is the prevention.

FIG 3 PREVENTIVE MEASURES FOR SCD

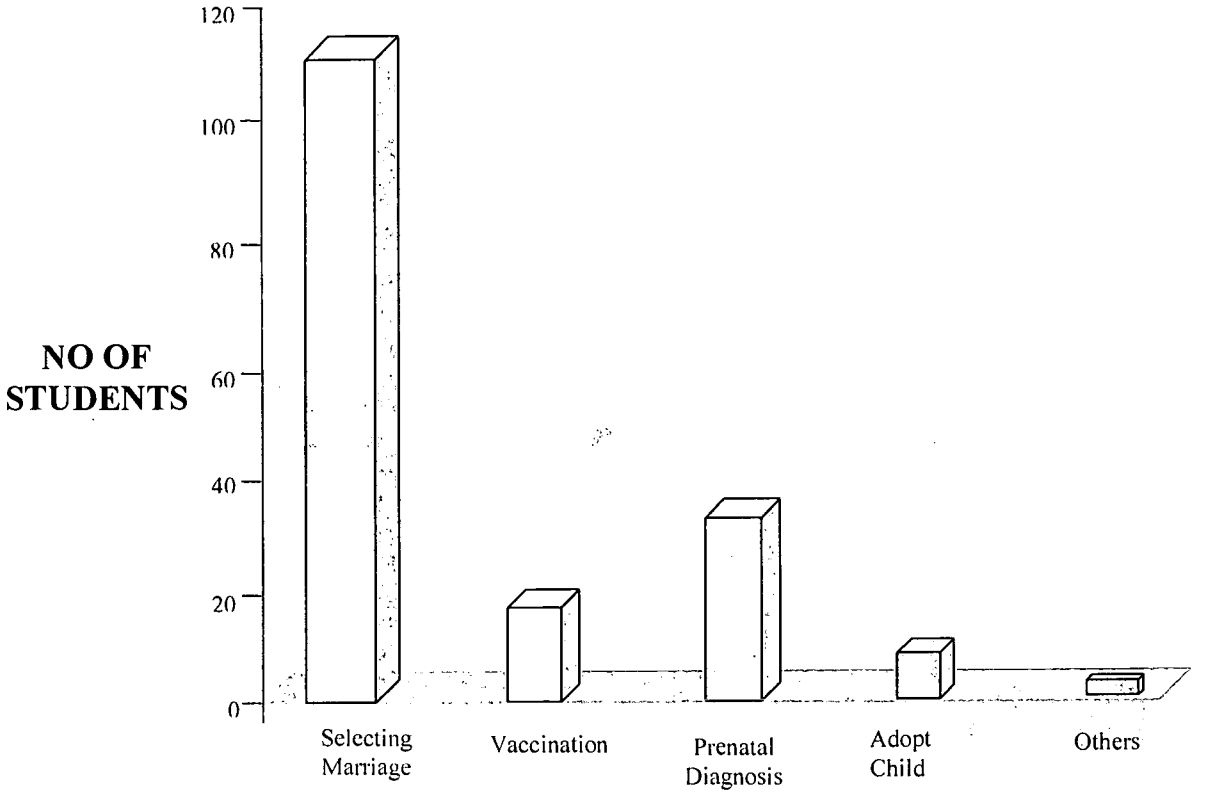


Table 11
Knowledge of Purpose of Genetic Counselling and Those Who Would Agree To Genetic Counselling.

Knowledge of purpose of genetic counselling	**Frequency**	**Percent**
Yes	106	76.30%
No	33	23.70%
Total	**139**	**100 %**
Agreement to genetic counselling		
Yes	112	80.60%
No	27	19.40%
Total	**139**	**100%**

76.30% know what the purpose of genetic counselling is, and 80.60% of these would agree to genetic counselling.

Table 12
Percentage of Respondents Who Think Couples Should Go For Premarital Screening.

Couples for premarital screening	Frequency	Percent
Yes	133	89.90%
No	11	7.40%
Not sure	4	2.7%
Total	**148**	**100 %**

89.90% are of the opinion that couples should go for genetic counselling, 7.4% do not approve of genetic counselling and 2.7 are not sure.

Table 13
Percentage of Respondents Who Want to Know Genotype of Partner Before Marriage.

Genotype of partner before marriage	Frequency	Percent
Yes	127	86.40%
No	10	6.80%
Not sure	10	6.80%
Total	**147**	**100%**

86.40% would want to know the genotype of their partner before getting married, 6.8% each said no and not sure.

Table 14
Respondents Who Will Continue with Marriage Irrespective of Genotype.

Continue marriage irrespective of genotype	Frequency	Percent
Yes	27	18.50%
No	58	39.70%
Not sure	61	41.80%
Total	**146**	**100%**

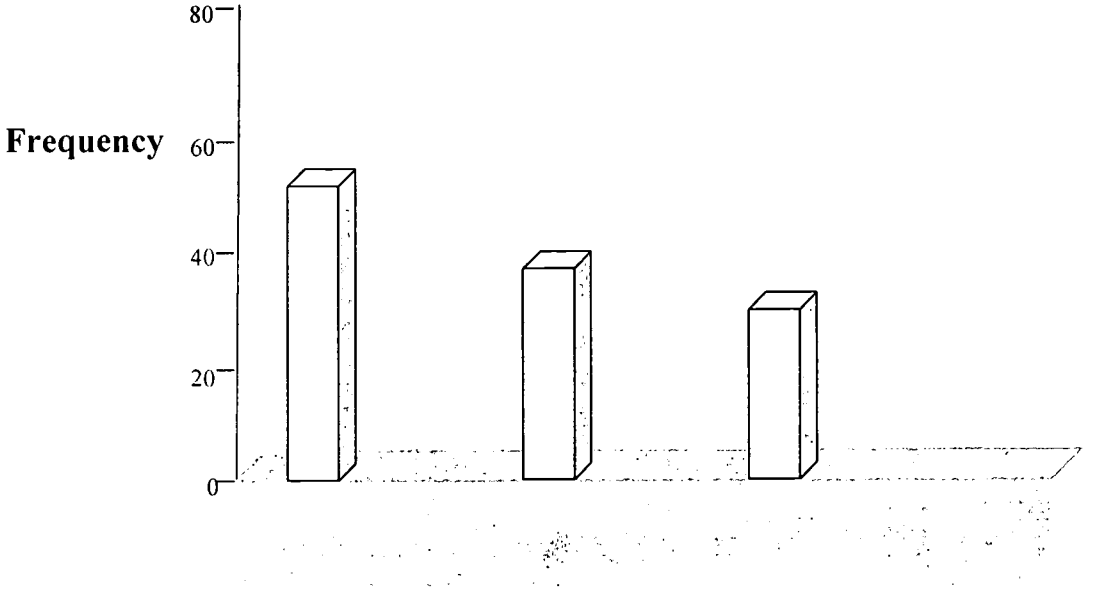
18.5% said they would continue with marriage plans irrespective of genotype, 39.7% said they would not continue with marriage plans.

Table 15
Respondents Who Would Have Children Regardless of Risks.

Decision to take if child has SCD	Frequency	Percent
Accept situation and continue to have children	53	44.20%
Stop bearing children	40	33.30%
Go for prenatal screening and abort SCD foetus	27	22.50%
Total	**120**	**100%**

44.2% would accept situation and continue to have children, 33.3% would stop bearing children while 22.5% would go for prenatal screening and abort SCD foetus.

FIG 4
FREQUENCY OF DECISION TO TAKE IF CHILD HAS SCD



DISCUSSION

This study was carried out on the students of College of Education, Ekiadolor, Edo State, Nigeria. Questionnaires were distributed to 150 unmarried students in the school of Arts and Social Sciences who were present in the College. All the 150 questionnaires distributed were returned. Five (5) out of these did not supply any information on awareness of SCD, 7 did not supply any information on how SCD is acquired, and whether they knew any test for the diagnosis of SCD. Of the 46 who had not done the genotype test before, only 23 gave reasons why they had not done the test.

Eleven respondents each did not answer the question on knowledge of genetic counselling and on agreement to do genetic counselling. Eighty-five percent of the respondents had knowledge of SCD while 15% did not. In a similar study by Oyewo (1996), on assessing the level of awareness on SCD among students in Yaba College of Technology, it was observed that 86% of subjects had heard of SCD while 14% had not. The greatest population of respondents (35.4%) had heard about SCD from family and relatives. Only 28.3% heard from print/electronic media. This level cannot be said to be adequate for a

country that has the longest burden of SCD worldwide (Akinyanju, 1997) Thus, more work needs to be done by the mass media and friends at home. Schoolteachers and lecturers are other significant sources of information

In this study it was found that 82.8% (124) respondents knew that frequent illness was a common feature of SCD, 21.3% knew about joint and bone pain occurring in SCD. However, only 3% knew about anaemia and jaundice being features of SCD. In Oyewo's study, 76% of the respondents at Yaba College of Technology indicated frequent illness as the most common feature of SCD followed by joint pain, anaemia then jaundice. In Desai's (1998), study, frequent illness was also found to be the most well known complication associated with SCD. Though a great majority of respondents (74%) knew the hereditary nature of SCD, the influence of cultural beliefs is still seen in this enlightened population. About 3% of them attributed SCD to evil forces. In a similar study done by Ohiochioya (1997), 72% of respondents know the hereditary nature of SCD while 7% thought it was due to evil spirit. However, in this study, 21% of respondents thought SCD could be acquired by blood transfusion. This is a misconception, which was probably stirred up by the frequent rate of blood transfusion to SCD patients. About 93.80% of the respondents knew about the genotype test but only 65.5% of these respondents had actually done the test. In Ohiochioya's study, a similar percentage of respondents had done the genotype test but when asked to state their genotype, some identified it as AB, AO, O etc. This goes a long way to show the need for provision of accurate laboratory tests that form part of the routine medical test carried out for various purposes and as pre-school entry requirement in this case.

51.80% of those who had done their genotype test did it out of personal choice and inquisitiveness. 25.80% did the test as part of pre-school entry. This was emphasized in the above paragraph i.e. need for schools to require for this test to be done so that the students can know their genotype at an age when they have not yet started contemplating to marry and thus be informed in the choice of partners. 18.60% indicated that test was requested by Doctor/Nurse due to illness, while 4.10% as requested from intending spouse. This small percentage goes to show that at the stage when most couples have fallen in love and have decided to get married, they do not give much thought to their genotype status. In Oyewo's (1996) study, 53% of students had their genotype test done, 50% of these did it as part of routine pre-school medical examination. Of those who had not done the test, 65.2% did not consider it necessary, 26.1% had never heard of it, 8.7% did not know where to do it. Among those who did not consider it necessary, some stated that they were healthy and did not see reason why they should do the test. The 8.7% who did not know where to do the test were

probably justified sine most hospitals do not have facilities for doing haemoglobin test. Even where they were available, they are quite expensive and people would not do it except if absolutely necessary. In a study by Brown et al (1998), none of the general students and less than 10% of medical and nursing students had had their genotype test done. These contrasting results, according to Brown et al, may be attributed to an increase in awareness of SCD over the few years interval between the two studies. Moreover, in this study majority of the students indicated that they had their genotype test done out of personal interest. Reasons for this contrasting results may be because university students, especially those with medical orientation, had been exposed to SCD and thus had developed interest in doing the test unlike the college of education students who were not as knowledgeable of SCD.

On the question on whether SCD can be cured, 36 (25.4%) said yes, 56 (37.4%) said no and 50 (35.2%) were not sure. Eight people did not answer the question. While on prevention, 19 (81.5%) believed SCD can be prevented and 14 (9.6%) said it could not be prevented, 8.9% were not sure. Various responses were given as possible preventive measures for SCD. Majority, 116 (77.3%) favoured selective marriage after testing and 47 (31.3%) support testing the genotype of unborn babies. However, out of those who responded, only 3% thought of adopting a child. This may be because of the stigma associated with adoption in our environment especially when one has no child of one's own. 1(one) respondent said divine prayers is the best preventive measure.

In non-directive approach to genetic counselling, the client is given all the important information concerning SCD: its mode of inheritance, associated complications and methods of control. The client is not advised against marrying sicklers or carriers but is allowed to make his/her own choice based on information given. Majority of the student 106 (76.3%) knew that this was the purpose of genetic counselling while 33 (23.7%) did not know. Out of these respondents, 112 (80.6%) would agree to genetic counselling and 27 (19.4%) would not.

On the issue of whether couples should go for premarital genetic screening, the majority of respondents, 133 (89.95%) concurred. Of these, 127 (85.4%) would ask their partners to do genotype test before marriage. Ten (6.8%) even said no. However, only 58 (37.7%) of those irrespective of genotype said they would not continue. Twenty-seven (18.5%) said they would while 61 (41.8%) were not sure. Kotoney (1991) notes that this theoretical option (selective marriage) should not be based on legislation and coercion. It has been noted that selective marriage could actually lead to an increase in population traits.

Of the 86 respondents that answered question on whether they would have children regardless of risk involved twenty-nine 33.70% of respondents said yes they would, 38 (44.20%) said no and 19 (22.20%) were not sure. On decision to take if child has SCD, 53 (44.20%) of respondents said they would accept the situation and continue to have children. Twenty-seven (22.50%) will go for prenatal diagnosis and abort the foetus, while 40 (33.3%) will stop bearing children. The acceptability of prenatal diagnosis was quite low probably due in part to lack of awareness of this mode of diagnosis in this part of the world.

CONCLUSION

This study was carried out on the NCE adolescent students of College of Education, where lectures on medical science are not included in the curriculum. Hence, none of the students in any of the schools that make up the College of Education receives or has received lectures on sickle cell disease education. It is therefore correct to assume that none of the students enjoys a selective advantage of superior knowledge of sickle cell disease as compared to students in other institutions.

The most well known complications associated with sickle cell disease were frequent illness. Most of the respondents obtained their first information on sickle cell disease from friends and relatives.

From the study, it was noted that 65.5% of respondents knew their genotype. Genetic counselling was found to be acceptable by 80.6% of respondents with a change in attitude expected in the case of pre-marital genetic counselling but very little change in attitude after post-marital genetic counselling in affected individuals.

As awareness of sickle cell disease increases all over the world, it becomes even more important that people receive the correct information on the aetiology, complications and methods of control of sickle cell disease. This can be achieved through appropriately designed health education programmes on sickle cell disease directed towards the various groups in the general population. Health talks will help remove all myths, misinformation and stigmatisation, which have been associated with SCD in the past. This, in turn, will stimulate interest in SCD and the people can then be encouraged to have the genotype test done. In addition, Genetic counselling by trained counsellors should be intensified at sickle cell clinics or clubs for all sicklers, carriers and their families.

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